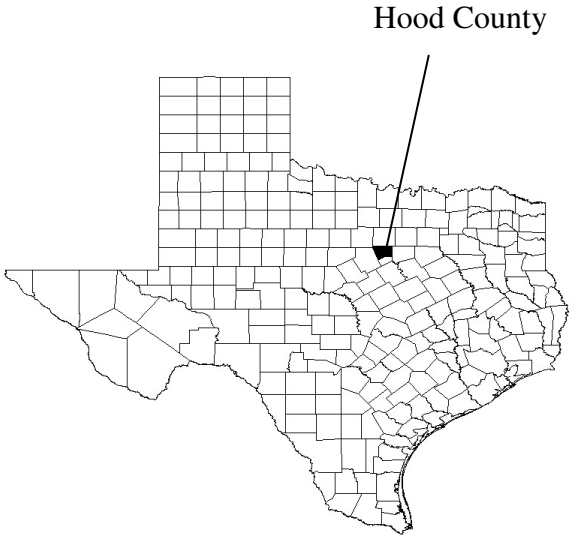
FLOOD INSURANCE STUDY

HOOD COUNTY, TEXAS
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
HOOD COUNTY UNINCORPORATED AREAS	480356
CRESSON, CITY OF	480177
DECORDOVA, CITY OF	480469
GRANBURY, CITY OF	480357
LIPAN, CITY OF	481075
TOLAR, TOWN OF	480868



PRELIMINARY:
JANUARY 23, 2017

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
48221CV000B

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Selected Flood Insurance Rate Map panels for the community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

This preliminary revised Flood Insurance Study contains Flood Profiles presented at a reduced scale to minimize reproduction costs. All Flood Profiles will be included and printed at full scale in the final published report.

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

Initial Countywide FIS Effective Date: August 16, 2012
Revised Countywide FIS Dates: TBD

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FLOOD INSURANCE STUDY
HOOD COUNTY, TEXAS AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Hood County, including the Cities of Cresson, DeCordova, Granbury and Lipan; the Town of Tolar; and the unincorporated areas of Hood County (referred to collectively herein as Hood County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that the City of Cresson is geographically located in Hood, Johnson, and Parker counties. The portions in Johnson and Parker Counties are not included in this FIS report.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence, and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

Information on the authority and acknowledgements for each jurisdiction with a pre-countywide printed FIS report is as follows:

Hood County

The hydrologic and hydraulic analyses for the previous FIS were performed by U.S. Geological Survey (USGS), for the Federal Emergency Management Agency (FEMA), under Interagency Agreement No. EMW-85-E-1823. That study was completed in January 1987 (Reference 1).

The hydrologic and hydraulic analyses for the study of the Brazos River upstream of the DeCordova Bend Dam were performed by Halff Associates, Inc. for the Brazos River Authority (BRA) in conjunction with Hood County, Texas. That study was completed in August 2009 (Reference 2).

City of Granbury

The hydrologic and hydraulic analyses for the previous FIS were performed by U.S. Army Corps of Engineers (USACE), Fort Worth District, for FEMA, under Interagency Agreement No. EMW-E-1153, Project Order No. 1. That study was completed in June 1986 (Reference 3).

The hydrologic and hydraulic analyses for the previous FIS were performed by the U.S. Department of Agriculture - Natural Resources Conservation Service (USDA-NRCS) (formerly known as Soil Conservation Service) for FEMA, under Interagency Agreement No. EMW-90-E-3289, Project Order No. 1. Topographic information in the vicinity of the Water's Edge subdivision was prepared by Davies, Inc. That study was completed in July 1991 (Reference 3).

There are no pre-countywide FISs for the Cities of Cresson, DeCordova, and Lipan; and the Town of Tolar; therefore, the previous authority and acknowledgement information for these communities is not included in this FIS.

This map revision was prepared for FEMA by Risk Assessment, Mapping, and Planning Partners (RAMPP), under FEMA Indefinite Delivery/ Indefinite Quantity (IDIQ) Contract No. HSFEHQ-09-D-0369. This study revision was completed on April 29, 2016.

Base map information for this study was provided by the North Central Texas Council of Governments, Texas Natural Resources Information System, and local City offices.

This data is referenced to the State Plane Coordinate System, Texas, North Central Zone (FIPS Zone 4202). Horizontal distances are measured in feet using the North American Datum of 1983 (NAD83), GRS 1980 Spheroid. Differences in the datum and spheroid used in the production of FIRMs for adjacent county may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on the FIRM.

1.3 Coordination

The initial Consultation Coordination Officer (CCO) meeting was held on April 30, 2007 and attended by representatives of FEMA, Brazos Bend, BRA, the Cities of Cresson and Granbury, Halff Associates, Inc., Hood County, Survey Services, Inc., Texas Master Gardener, and Texas Department of Transportation (TxDOT).

The results of the initial study were reviewed at the final CCO meeting held on May 12, 2010 and attended by representatives of FEMA; Baird, Hampton & Brown, Inc.; Brazos Bend; the Cities of Cresson, DeCordova, and Granbury; Halff Associates, Inc.; Hood County and Texas Water Development Board (TWDB). All concerns raised at that meeting have been addressed in this study.

The results for this revision were reviewed at the final CCO meeting held on _____ and attended by _____.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Hood County, Texas, including the incorporated communities listed in Section 1.1. The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction through June 2009.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon, by FEMA and community officials. The flooding sources studied by detailed

methods along with the limits of study are shown in Table 1, "Scope of Study."

Table 1 - Scope of Study
Stream Reaches Studied by Detailed Methods

Stream Name	Downstream Limit	Upstream Limit	Length (mi)
Detailed Study Streams			
Brazos River	DeCordova Bend Dam/ Rainey Court	Hood County/ Parker County	31.50
Redelineated Detailed Study Streams			
Brazos River	Hood County/Somervell County	DeCordova Bend Dam/ Rainey Court	16.34
Lambert Branch	From confluence with Brazos River	1,880 feet upstream of Holmes Drive	5.28
Rough Creek	0.70 miles upstream of confluence with Brazos River	1.33 miles upstream of confluence with Brazos River	0.63
Stream LB-1	From confluence with Lambert Branch	3,460 feet upstream of confluence with Lambert Branch	0.66
Stream LB-2	From confluence with Lambert Branch	585 feet upstream of Ross Lane	2.12

Table 2, "Stream Name Changes" lists those streams whose name has changed or differs from those published in the previous FIS for Hood County or any of the communities within.

Table 2 - Stream Name Changes

Community Name	Old Stream Name	New Stream Name
City of Granbury/ Hood County	Lake Granbury	Brazos River

2.2 Community Description

Hood County is located in northeastern Texas, approximately 60 miles southwest of Dallas. It is bordered by Parker County to the north; Erath County to the west; Somervell County to the south; Johnson County to the east, and Palo Pinto County to the northwest (Reference 1).

Hood County was inhabited by Lipan Apache and Comanche. The Anglo-American settlers arrived in the late 1840's. The county was created in 1866 and named after the Confederate General John B. Hood (Reference 4).

According to U.S. Census 2000 figures, the population of Hood County was 41,100. This represents an increase in population of 41.8% since the 1990 census. The January

communities in the county; their population estimates are as follows: the City of Cresson (443), the City of DeCordova (3,032), the City of Granbury (7,753), the City of Lipan (498), and the Town of Tolar (659) (Reference 5).

Hood County is mainly composed of Grand Prairie and West Cross Timbers Land Resources Areas. A small area in the northwest corner of Hood County is in the North Central Prairies Land Resource Area. Sharp changes in the vegetation are associated with different soils and topography. The county is characterized by open prairie grasslands, juniper-covered limestone hills, and sandy areas on uplands and along the Brazos River. The woody vegetation is composed of shinnery, blackjack, post, and live oaks. The terrain, cut by the Brazos and Paluxy Rivers, is rough, with eroded plateaus and ravines (Reference 6).

The economy of the county relies on tourism, commuting to Fort Worth, and a nuclear power plant. Hay, turf grass, beef cattle, nursery crops, pecans, and peaches are among the main agricultural products manufactured in Hood County (Reference 4). Near the Brazos River at DeCordova Bend, residential development has been growing. The remainder of the downstream reach is dominated by agriculture and sand quarry activities (Reference 1).

Recreational activities include fishing, summer theater, scenic areas, Lake Granbury, and Acton State Park (Reference 4).

Hood County is composed of several soil formations. The Windthorst-Duffau soil association is composed of loamy and sandy soils that formed in loamy sediments, in stratified clayey sandy, or weakly cemented sandstone. The main limitation of the soil is a slow water intake rate of most of the soils, and in addition the soils are highly erodible. The Bastrop-Yahola soil association is composed of loamy and sandy soils that formed in loamy sediments and in loamy calcareous alluvium. It can be found near the Brazos River. The Chaney-Nimrod soil association is composed of sandy soils that formed in clayey, loamy, and sandy sediments. It is located on numerous drainage ways and streams. Soil blowing and the slow water intake rate are limitations for cultivated crops. The Frio Bosque soil association is composed of clayey and loamy soils that formed in calcareous, clayey and loamy alluvium. It is located on floodplains of streams that drain areas of soils that formed over limestone (Reference 6).

The annual average rainfall for Hood County is 33.10 inches. The wettest month is May having an average of 4.70 inches of precipitation. The driest month is August having an average of 1.60 inches of precipitation. The average annual temperature is 65.8 degrees Fahrenheit (^{o}F). The hottest month of the year is July having an average temperature of 97.0 ^{o}F. The coldest month of the year is January having an average temperature of 33.0 ^{o}F (References 4 and 7).

2.3 Principal Flood Problems

Generally, the major storms experienced in Hood County are produced by heavy rainfall from frontal-type storms that may occur at any time during the year, but are more prevalent in the spring and summer months. Major flooding can be produced by the intense rainfall usually associated with these localized thunderstorms (Reference 3).

The most serious flood problems in Hood County are created by overbank flows in the Brazos River. The river flows generally southward across the county from Parker County on the north to Somervell County on the south (a distance of 49.8 miles). The most serious

potential for flood damage along the Brazos River in Hood County is along the natural channel extending downstream from DeCordova Bend Dam to the Somervell County boundary (Reference 1).

The flood damage potential in the downstream reach of Lake Granbury, the segment that lies between the southern corporate limits of the City of Granbury and the DeCordova Bend Dam, is low due to the effects of storage within the lake coupled with the floodgate operation of the dam. The upper reach of Lake Granbury, from the northern corporate limits of the City of Granbury to the northern Hood County boundary, has a moderate flood damage potential because of its riverine characteristics. There are many residential developments along the lake shores where structures have been built below the 1-percent-annual-chance flood elevation and are subject to flood damage (Reference 1).

There are several mainstem USGS flow gages throughout the Lake Granbury Watershed. In addition to these mainstem gages, there are numerous other USGS gages on tributaries and at smaller reservoirs throughout the watershed. In total, over 64 USGS streamflow gages have been or are currently in service within the Brazos River Watershed above the Glen Rose gage (downstream of DeCordova Bend Dam).

The gaging station near Dennis is at river mile 589.8 upstream of Lake Granbury and has a period of record from May 1968 to the present. The Brazos River, near the Dennis gage, has a drainage area of 25,237 square miles. The maximum discharge for the period of record was 96,600 cubic feet per second (cfs) on October 14, 1981. The gage height of 729.66 feet North American Vertical Datum of 1988 (NAVD), reached during the flood of October 14, 1981, was the highest since at least 1930. A floodwater mark of 729.61 feet NAVD was observed in May 1957 (References 1 and 3).

The gaging station near Glen Rose is at river mile 511.2 downstream of Lake Granbury and has a period of record from October 1923 to the present. The Brazos River, near the Glen Rose gage, has a drainage area of 25,818 square miles. The maximum discharge for the period of record was 97,000 cfs, which occurred on May 18, 1935. On October 15, 1981, the maximum observed discharge was 86,400 cfs (References 1 and 3).

The gaging station near Seymour is at river mile 847.4 from the Gulf of Mexico. Historical storms' analyses indicate that the largest floods through Lake Granbury have originated below the Seymour gage. Total travel time for flows above the Seymour gage to reach Lake Granbury is over four days. This indicates that any flow from above the Seymour gage would most likely not contribute to the peak flows at Lake Granbury for frequency flood events (not including the Probable Maximum Flood). Since 1924, the largest recorded flows at the Seymour gage occurred in October 1926 (95,400 cfs), August 1926 (82,100 cfs), and June 1930 (79,600 cfs). For the two 1926 events, the peakrecorded flow at the Palo Pinto gage, at river mile 667.3 from the Gulf of Mexico, was approximately one-half the Seymour flow indicating significant attenuation of the hydrograph. Peak flows at the Palo Pinto and Dennis gages occurred during the April 1957, October 1981, May 1941, August 1978, April 1990, and December 1991 floods. During four of these six events, the peak flow at Seymour for that respective water year was not affiliated with these storm events; indicating that the majority of the flow below Possum

Kingdom did not originate above the Seymour gage. Only the May 1941 and June 1930 events included significant flows from above the Seymour gage (Reference 2).

2.4 Flood Protection Measures

The upper 31.5 miles of the Brazos River channel in Hood County is in Lake Granbury, formed by the DeCordova Bend Dam. The dam is located at river mile 542.5, 7.5 miles southeast of the City of Granbury (References 1 and 3).

The 2,256 feet long Ambursen type concrete and earth-filled dam is owned and operated by the BRA primarily for the conservation of water for irrigational, municipal and industrial water supply, and electrical power generation. The dam includes a 932-foot concrete spillway consisting of 16 tainter gates that are 36 feet by 35 feet and two sluice gates that are 7 feet by 8 feet. The lake has a drainage area of 25,679 square miles, of which 9,566 square miles are probably noncontributing. Deliberate impoundment of Lake Granbury began on September 15, 1969 (Reference 3).

Since Lake Granbury has no storage space specifically provided for flood control purposes, flood-flows will be passed through the lake essentially as they occur. The presence of DeCordova Bend Dam has the effect of raising the elevation of flooding in the Brazos River Valley around the lake shore to a level higher than would occur without the dam in place (References 1 and 3). Due to the significant gate capacity at Lake Granbury, the system floods can generally be held to 694.1 feet NAVD at the DeCordova Bend Dam; however, local floods that are generated off the surface of Lake Granbury and nearby watersheds are not always predictable and watershed response is prompt (References 1 and 3).

Flow on the Brazos River at the gage near Dennis at river mile 589.8 is largely regulated by upstream releases from storage in Possum Kingdom Lake (completed in 1941) and Lake Palo Pinto (completed in 1964). There is considerable warning time since the travel time of flood releases from Possum Kingdom is approximately 48 hours. Flow is also affected, at times, by ten floodwater retention structures controlling runoff from 46.5 square miles in the upstream drainage basin. Flow on the Brazos River at the gage near Glen Rose at river mile 511.2 has been regulated by Lake Granbury since September 1969 and by the same structures affecting the Dennis gage prior to 1969 (References 1 and 3).

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions

existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

August 16, 2012 Initial Countywide Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the county.

For this revision, hydrologic analyses are carried out to establish peak discharge-frequency relationships for each flooding sources for all scoped streams in this approximate (Zone A) study within Hood County, Texas and Incorporated Areas.

The hydrologic method used for this analysis is the latest U.S. Geological Survey (USGS) regional regression equations. The peak flow discharges were obtained for the 50-, 20-, 10-, 4-, 2-, 1- and 0.2-percent annual chance flood events, including the 1-percent plus discharge that is required by FEMA.

This Revision

For this revision, hydrologic analyses are carried out to establish peak discharge-frequency relationships for each flooding sources for all scoped streams in this approximate (Zone A) study within Hood County, Texas and Incorporated Areas.

The hydrologic method used for this analysis is the latest U.S. Geological Survey (USGS) regional regression equations. The peak flow discharges were obtained for the 50-, 20-, 10-, 4-, 2-, 1- and 0.2-percent annual chance flood events, including the 1-percent plus discharge that is required by FEMA.

3.1.1 New Detailed Study Streams

A new detailed hydrologic model was prepared for the Brazos River upstream of the DeCordova Bend Dam. The *Lake Granbury Flood Protection Planning Study* was prepared for the BRA in conjunction with Hood County, Texas (Reference 2).

The total Brazos River Watershed area draining to DeCordova Bend Dam is 25,679 square miles with 9,566 square miles classified as non-contributing according to the USGS. The 9,566 square miles of drainage area is located above the Seymour gage and includes the playa lakes in far west Texas located on the Caprock. For the *Lake Granbury Flood Protection Planning Study*, the upper limits of the hydrologic model extended to the Seymour gage along the mainstem of the Brazos River and included the entire Clear Fork of the Brazos River Watershed. Approximately 5,975 square miles of contributing drainage area above the Seymour gage on the Brazos River mainstem was not included in the hydrologic model for this study since it was determined that flow from above the Seymour gage would most likely not contribute to the peak flows at Lake Granbury for frequency flood events (not including the Probable Maximum Flood) (Reference 2).

The Hydrologic Engineering Center (HEC) Hydrologic Modeling System (HEC-HMS) Version 3.1.0 was utilized for the rainfall-runoff modeling for the Lake Granbury study area (Reference 8). The watershed was divided into sub-basins based on USGS 30-meter digital elevation terrain data. The initial/constant loss method was selected for the rainfall loss rate. Snyder's unit hydrograph method was the selected unit hydrograph

technique. Hydrologic routing data for all the tributaries throughout the study area and the mainstem Brazos River above the Dennis gage were developed using modified Puls storage outflow relationships computed with the HEC River Analysis System (HEC-RAS) Version 3.1.3 (Reference 9). Unsteady HEC-RAS routing was used for the mainstem of the Brazos River from the Dennis gage to the DeCordova Bend Dam. The HEC-HMS model was calibrated using historical storm data.

A HEC Reservoir System Simulation (HEC-ResSIM) version 3.0 model was developed to simulate the gate operations at DeCordova Bend Dam during flood events and to generate release hydrographs and stage hydrographs at the dam (References 2 and 10). A critical storm centering approach was used to derive the centering location that produced the highest peak flows at the Dennis gage. Point rainfall depths were obtained from the *USGS Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas* published in 2004 for a given storm centering location (Reference 11). The point rainfall was reduced based on an areal reduction curve developed from a range of sources including the Lower Colorado River (Texas) Flood Damage Evaluation Project, U.S. Weather Bureau Technical Paper No. 40, U.S. Weather Bureau Technical Paper No. 49, Hydrometeorological Report No. 52 (HMR-52), and *Areal Reduction Factors for Precipitation of the 1-Day Design Storm in Texas*, published by the USGS in 1999 (References 12, 13, 14, 15, and 16). The Huff median first quartile curve was used for the rainfall distribution. The 10-, 2-, 1-, and 0.2-percent-annual-chance flood hydrographs were developed (Reference 2).

3.1.2 Redelineated Detailed Study Streams

The redelineated streams were initially studied by detailed methods. These flooding sources include all those listed in Table 1, "Scope of Study."

The 10-, 2-, and 1-percent-annual-chance flood hydrographs for the Brazos River downstream of the DeCordova Bend Dam were developed from a volume-duration-frequency analysis using the October 1981 flood at the Dennis gage as a pattern hydrograph and a period of record of stream flow from 1941 to 1983 for the USGS stream gaging stations on the Brazos River near Dennis and Glen Rose (References 1 and 3).

The hydrologic analyses for Lambert Branch, Rough Creek, Stream LB-1, and Stream LB-2 were developed using the computer program NUDALLAS (Reference 17). The watershed was divided into sub-basins, and synthetic unit and flood hydrographs were developed at selected locations. U.S. Weather Bureau Technical Paper No. 40, National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum (National Weather Service (NWS) Hydro-35, and the USACE Civil Engineer Bulletin No. 52-8 were used in developing the 10-, 2-, and 1-percent-annual-chance frequency storms (References 13, 18 and 19). For Lambert Branch and Stream LB-2 upstream of U.S. Route 377, peak discharges were determined by routing various storm frequencies with a 24-hour rainfall duration using the USDA-NRCS Technique Release No. 20 (Reference 20). The 0.2-percent-annual-chance storm was based on extrapolated data. Peak discharge-frequency values were computed for selected locations. Routing of the flood hydrographs through each sub-basin reach was accomplished using a modified Puls reservoir routing. The HEC-2 step-backwater model provided the elevation-discharge-storage relationships (Reference 21).

Peak discharge-drainage area relationships for the streams studied by detailed methods are shown in Table 3, "Summary of Discharges."

Table 3 - Summary of Discharges

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. mile)	PEAK DISCHARGES (cfs) 10% Annual Chance	2 % Annual Chance	1% Annual Chance	0.2% Annual Chance
BRAZOS RIVER					
At Hood County/Somervell County	25,779[1]	*	*	123,700	*
At DeCordova Bend Dam	25,679[1]	58,700	105,400	118,200	166,000
At U.S. Route 377	25,625[1]	58,550	105,200	118,050	165,900
At the Hood County/Parker County Boundary	25,454[1]	59,750	108,550	123,300	173,700
LAMBERT BRANCH					
At U.S. Route 377 Business	5.52	4,450	6,230	7,120	8,450
At Houston Street	5.02	4,240[2]	5,950[2]	6,810[2]	8,100[2]
Just downstream of confluence of Stream LB-1	4.67	4,620	6,440	7,290	8,560
Just upstream of confluence of Stream LB-1	2.55	2,490	3,420	3,850	4,560
Just downstream of confluence of Stream LB-2	2.23	2,380	3,260	3,660	4,330
Just upstream of confluence of Stream LB-2	1.49	1,850	2,540	2,860	3,310
At U.S. Route 377	1.04	1,033	1,607	1,890	2,503
At Holmes Street	0.86	1,001	1,542	1,806	2,377
ROUGH CREEK					
At State Route 144	7.06	7,390	10,100	11,380	13,200
Adjacent to Fiesta Way	6.48	7,020	9,590[2]	10,900	12,650
At Live Oak Trail	6.15	7,000	9,620	10,840	12,490
STREAM LB-1					
At confluence with Lambert Branch	2.12	2,200	3,100	3,550	4,100
STREAM LB-2					
At confluence with Lambert Branch	0.74	550	730	820	1,050
At downstream side of U.S. Route 377 Bypass	0.54	350	460	550	870
At upstream side of U.S. Route 377 Bypass	0.53	354[2]	500[2]	575[2]	820[2]
At Holmes Drive	0.23	389	623	736	989

* No data available.

[1] Drainage Area includes 9,566 sq. mi. of non-contributing area

[2] Decreased due to storage routing effects

3.2 Hydraulic Analyses

August 16, 2012 Initial Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the Flood Insurance Rate Map (FIRM) represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the FIRM.

The hydraulic analyses for the initial county wide study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

This Revision

For this revision, water surface elevations for the 1-percent-annual-chance floods were computed using HEC-RAS Version 4.1.0 (Reference 22).

3.2.1 Detailed Study Streams

A hydraulic model of the Brazos River was developed to compute water surface elevations above the DeCordova Bend Dam as part of the *Lake Granbury Flood Protection Planning Study*. Water surface elevations of floods of the selected recurrence intervals were computed using the unsteady flow computation routine in HEC-RAS Version 4.0 (Reference 23). Along with the water surface profile, flow and stage hydrographs at desired locations such as bridges or cross-sections of interest were computed as well. Cross sections were extracted from a terrain dataset composed of the 2007 North Central Texas Council of Governments (NCTCOG) Auto-Correlated Surface (ACS) topography supplemented with 2008 channel and bridge surveys, and 2003 Texas Water Development Board volumetric surveys of Lake Granbury (References 24 and 25). The downstream boundary condition was the stage hydrograph computed by HEC- ResSIM at the DeCordova Bend Dam. Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observation of the streams and the floodplain areas. Flood profiles were drawn showing computed water surface elevations for floods of the selected recurrence intervals (Reference 2).

3.2.2 Redelineated Detailed Study Streams

The analyses for the redelineated study streams were taken from the prior Flood Insurance Studies for Hood County. The Base (1-percent-annual-chance) Flood Elevations (BFEs) from the profiles were plotted on the best available topographic data to better define the special flood hazard areas. The redelineated streams are identified in Section 2.1.

For the Brazos River downstream of the DeCordova Bend Dam, cross sections were developed from 2-foot contour interval map obtained from SEMCO, Inc., Surveying-Mapping-Planning-Consultants, of Fort Worth, Texas; obtained from the BRA of Waco, Texas; obtained from field surveys done by the USGS; developed from USGS 10-foot contour maps; and synthesized where terrain similarities existed. The tailwater elevation for the 1-percent-annual-chance flood discharge at DeCordova Bend Dam was obtained from the Brazos River Authority's Lake Granbury Probable Maximum Flood Analysis (Reference 26).

For Lambert Branch, Rough Creek, Stream LB-l, and Stream LB-2, the cross sections for the backwater analysis were obtained from bridge data obtained by field measurements and by bridge plans from the TxDOT and from the City of Granbury. For Lambert Branch and Stream LB-2 upstream of U.S. Route 377, cross sections were field surveyed at selected locations.

Water surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (Reference 21). For Lambert Branch and Stream LB-2 upstream of U.S. Route 377, water surface elevations of floods of the selected recurrence intervals were computed using the USDA-NRCS WSP-2 computer program (Reference 27). Flood profiles were drawn showing computed water surface elevations for floods of the selected recurrence intervals.

The starting water surface elevations for Lambert Branch and Rough Creek were taken from the conservation pool elevation on Lake Granbury. The starting water surface elevations for Brazos River downstream of the DeCordova Bend Dam (at the southern county boundary), Stream LB-l, and Stream LB-2 were determined by the slope-area method (Reference 3).

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observation of the streams and the floodplain areas. For the Brazos River downstream of the DeCordova Bend Dam, vertical roughness factors were used for cross section 974+20 and were assigned based on elevations as follows: 0.080 below 641.14 feet NAVD and 0.055 between 641.14 and 672.24 feet NAVD (Reference 3).

Channel and overbank "n" values for the streams studied by detailed methods are shown in Table 4, “Summary of Roughness Coefficients.”

Table 4 - Summary of Roughness Coefficients
Stream Reaches Studied by Detailed Methods

Stream Name	Channel "n" Value	Overbank "n" Value
Brazos River	0.030 - 0.045	0.035 - 0.200
Lambert Branch	0.035 - 0.065	0.060 - 0.090
Rough Creek	0.035 - 0.065	0.060 - 0.085
Stream LB-1	0.050	0.070
Stream LB-2	0.020 - 0.060	0.055 - 0.080

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. Some of the data used in this revision were taken from the prior effective FIS reports and FIRMs and adjusted to NAVD88. The datum conversion factor from NGVD29 to NAVD88 in Hood County is +0.14 feet.

For information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey (NGS) website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services, NOAA
N/NGS12, National Geodetic Survey
SSMC3, #9340
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages state and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2- percent- annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 5 and 10 feet (Reference 28)

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent- annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM.

Approximate 1-percent-annual-chance floodplain boundaries in some portions of the study area were taken directly from the Flood Hazard Boundary Map for Hood County (Reference 1).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are

presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies. The floodways presented in this study were computed for certain stream segments on the basis of equal- conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (see Table 5, "Floodway Data"). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown. A floodway was not computed for the Brazos River due to the storage capacity of the lake area.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD 88)	WITHOUT FLOODWAY (FEET NAVD 88)	WITH FLOODWAY (FEET NAVD 88)	INCREASE (FEET)
Lambert Branch								
A	5,920	160	1,030	6.8	699.5	699.5	699.5	0.0
B	6,750	150	1,232	5.5	702.7	702.7	702.9	0.2
C	7,180	77	667	10.2	702.9	702.9	703.1	0.2
D	8,070	140	1,106	6.2	706.0	706.0	706.1	0.1
E	8,550	240	1,968	3.5	710.6	710.6	711.3	0.7
F	9,600	200	1,235	5.5	714.7	714.7	715.4	0.7
G	10,500	280	2,317	3.1	717.7	717.7	718.5	0.8
H	12,200	310	1,866	3.9	719.8	719.8	720.6	0.8
I	13,830	200	1,178	4.7	723.5	723.5	724.1	0.6
J	14,470	130	590	4.6	724.7	724.7	725.3	0.6
K	15,930	130	929	2.4	732.2	732.2	733.0	0.8
L	17,440	150	607	4.9	741.8	741.8	742.3	0.5
M	18,520	180	623	4.6	751.6	751.6	752.5	0.9
N	19,950	241	1,217	2.4	764.4	764.4	765.4	1.0
O	20,660	180	585	4.9	768.3	768.3	768.8	0.5
P	21,540	169	762	3.8	775.2	775.2	776.1	0.9
Q	23,160	169	975	2.0	789.8	789.8	789.8	0.0
R	24,590	73	553	3.4	792.2	792.2	792.9	0.7
S	26,020	107	402	4.6	802.7	802.7	803.7	1.0
T	27,900	59	245	7.2	819.4	819.4	820.4	1.0

[1]Stream distance in feet above confluence with Brazos River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

FLOODWAY DATA

LAMBERT BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD 88)	WITHOUT FLOODWAY (FEET NAVD 88)	WITH FLOODWAY (FEET NAVD 88)	INCREASE (FEET)
Rough Creek								
A	3,696	150	1,403	7.8	704.2	704.2	704.2	0.0
B	4,651	150	1,485	7.3	712.1	712.1	712.4	0.3
C	5,636	400	1,431	7.6	716.6	716.6	716.6	0.0
D	5,986	200	1,828	6.0	717.7	717.7	718.6	0.9
E	6,446	150	1,208	9.0	720.5	720.5	721.0	0.5
F	7,036	99	757	14.3	724.0	724.0	724.2	0.2

[1] Stream distance in feet above confluence with Brazos River.

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

FLOODWAY DATA

ROUGH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD 88)	WITHOUT FLOODWAY (FEET NAVD 88)	WITH FLOODWAY (FEET NAVD 88)	INCREASE (FEET)
Stream LB-1								
A	820	144	783	4.5	720.9	720.5[2]	721.1	0.6
B	3,460	230	1,370	2.6	725.8	725.8	726.8	1.0

[1] Stream distance in feet above confluence with Lambert Branch.
[2] Elevation computed without consideration of backwater effects from Lambert Branch

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

FLOODWAY DATA

STREAM LB-1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (Feet NAVD 88)	WITHOUT FLOODWAY (Feet NAVD 88)	WITH FLOODWAY (Feet NAVD 88)	INCREASE (Feet)
Stream LB-2								
A	1,140	160	700	1.2	742.2	742.2	743.2	1.0
B	2,990	80	187	2.9	755.8	755.8	756.7	0.9
C	3,823	775	5,378	0.1	775.8	775.8	775.8	0.0
D	5,045	110	358	1.6	775.8	775.8	775.8	0.0
E	9,468	65	154	4.8	813.7	813.7	814.3	0.6
F	9,561	48	126	5.9	815.4	815.4	815.9	0.5
G	10,566	52	124	5.3	826.7	826.7	827.0	0.3
H	10,676	27	100	6.5	828.8	828.8	829.4	0.6
I	11,211	111	183	3.2	833.5	833.5	833.7	0.2

[1]Stream distance in feet above confluence with Lambert Branch

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

FLOODWAY DATA

STREAM LB-2

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water surface elevation (WSEL) of the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

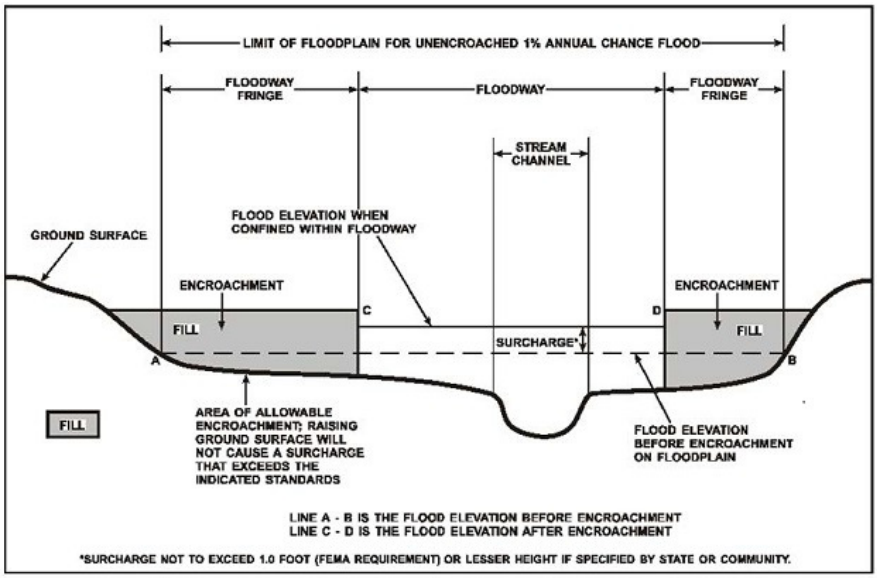

Figure 1: Floodway Schematic

In the case of redelineation, effort was made to maintain the prior effective regulatory floodway width and shape. However, due to updated topographic data, some modifications were made to contain the floodway within the limits of the 1-percent-annual-chance floodplain. Most modifications to the prior effective regulatory floodway boundaries are due to topographic changes that have occurred along the streams.

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 5 for certain downstream cross sections of Stream LB-1 are lower than the regulatory flood elevations in that area, which must take into account the 1-percent-annual-chance flooding due to backwater from other sources.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile (sq. mi.), and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide FIRM presents flooding information for the entire geographic area of Hood County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the county identified as flood-prone. This countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 6, “Community Map History.”

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISIONS DATE
Cresson, City of*	October 18, 1977	None	October 18, 1988	September 5, 1990
DeCordova, City of*	October 18, 1977	None	October 18, 1988	September 5, 1990
Granbury, City of	July 9, 1976	None	January 15, 1988	May 16, 1994
Hood County Unincorporated Areas	October 18, 1977	None	October 18, 1988	September 5, 1990
Lipan, City of	October 29, 1976	None	October 1, 2009	
Tolar, Town of	July 18, 1975	None		

*This community did not have its own FIRM prior to the first countywide FIS. The land area for this community was previously shown on the FIRM for the unincorporated areas of Hood County, but was not identified as a separate NFIP community. Therefore, the dates for this community were taken from the Hood County FIRM.

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

The preparation of updated Flood Insurance Studies is on-going for the Incorporated and Unincorporated Areas of Erath, Johnson, and Palo Pinto counties, Texas. An updated FIS has been prepared for the Incorporated and Unincorporated Areas of Parker County, Texas. The Hood County Study is in agreement with these studies.

This FIS report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA Region VI, Federal Insurance and Mitigation Division, 800 North Loop 288, Denton, Texas 76209.

9.0 BIBLIOGRAPHY AND REFERENCES

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19. U.S. Army Corps of Engineers, Civil Engineer Bulletin No. 52-8, Standard Project Flood Determinations, March 26, 1952, revised 1965.

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Auto-Correlated Surface (ACS), Contour Interval 2 feet, March 2007.

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10.0 NOTES TO USERS AND MAP LEGEND FOR FIRM

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates, refer to the Hood County, Texas and Incorporated Areas FIRM Index.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

PRELIMINARY FIS REPORT: FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period, at the final Consultation Coordination Officer's meeting, or during the statutory 90-day appeal period. Approved requests for changes will be shown on the final printed FIRM.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

FLOODWAY INFORMATION: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.3 "Non-Levee Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was 4202. The horizontal datum was NAD 83 GRS 1980 Spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to the North American Vertical Datum of 1988 (NAVD 88). These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988 (NAVD 88), visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community located on the Hood County, Texas and Incorporated Areas FIRM Index.

BASE MAP INFORMATION: Base map information was derived from the North Central Texas Council of Governments, Texas Natural Resources Information System, and Local City offices.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Hood County, Texas, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to the Hood County, Texas and Incorporated Areas Index to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Hood County, Texas, effective August 8. 8888.

FLOOD RISK REPORT: A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

SPECIAL FLOOD HAZARD AREAS: *The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights. See note for specific types. If the floodway is too narrow to be shown, a note is shown.*

Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)

Zone A — The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE — The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone, either at cross section locations or as static whole-foot elevations that apply throughout the zone.

Zone AH — The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the hydraulic analyses are shown at selected intervals within this zone.

Zone AO — The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the hydraulic analyses are shown within this zone.

Zone AR — The flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

Zone A99 — The flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.

Zone V — The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.

Zone VE — Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.

Regulatory Floodway determined in Zone AE.

OTHER AREAS OF FLOOD HAZARD

Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.

Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.

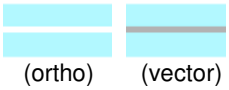
Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1% annual chance flood.

OTHER AREAS

Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible

Unshaded Zone X: Areas determined to be outside the 0.2% annual chance flood hazard

FLOOD HAZARD AND OTHER BOUNDARY LINES



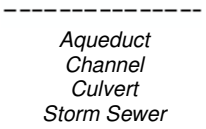
Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)

Limit of Study

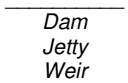
Jurisdiction Boundary

Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet

GENERAL STRUCTURES



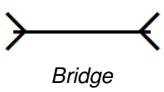
Channel, Culvert, Aqueduct, or Storm Sewer



Dam, Jetty, Weir

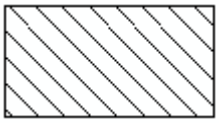
Levee, Dike, or Floodwall accredited or provisionally accredited to reduce the flood risk from the 1% annual chance flood.

Levee, Dike or Floodwall not accredited to reduce the flood risk from the 1% annual chance flood.



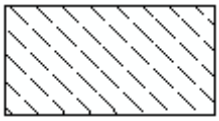
Bridge

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA): *CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.*



CBRS AREA
09/30/2009

Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.



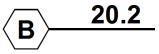
OTHERWISE PROTECTED AREA
09/30/2009

Otherwise Protected Area

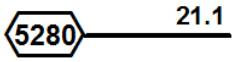
REFERENCE MARKERS

River mile Markers

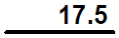
CROSS SECTION & TRANSECT INFORMATION



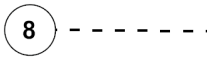
Lettered Cross Section with Regulatory Water Surface Elevation (BFE)



Numbered Cross Section with Regulatory Water Surface Elevation (BFE)



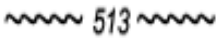
Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)



Coastal Transect

Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.

Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.



Base Flood Elevation Line (shown for flooding sources for which no cross sections or profile are available)

ZONE AE (EL 16)

Static Base Flood Elevation value (shown under zone label)

ZONE AO (DEPTH 2)

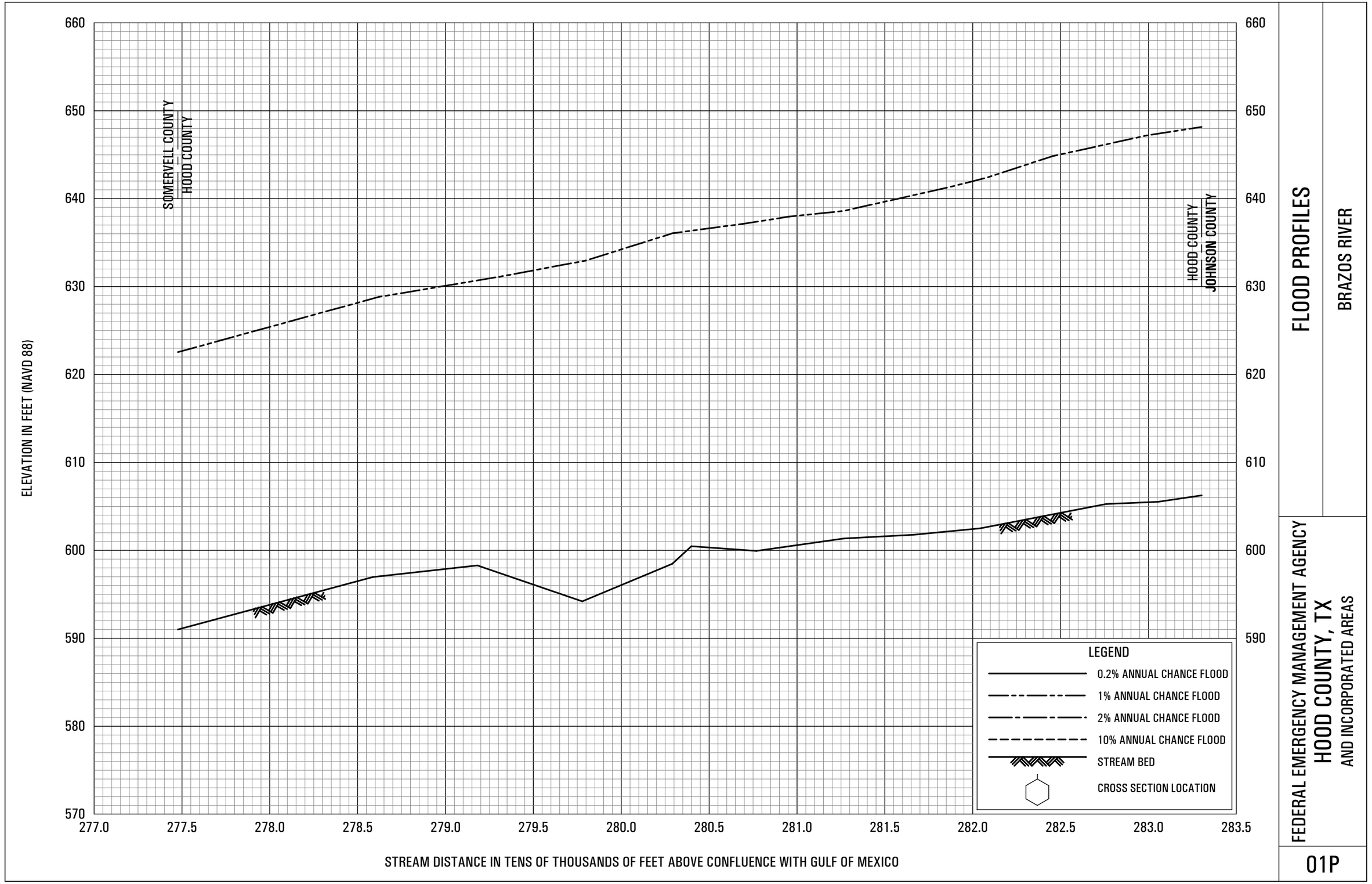
Zone designation with Depth

ZONE AO (DEPTH 2) (VEL 15 FPS)

Zone designation with Depth and Velocity

BASE MAP FEATURES

Missouri Creek	River, Stream or Other Hydrographic Feature
234	Interstate Highway
234	U.S. Highway
234	State Highway
234	County Highway
MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad
	Horizontal Reference Grid Line
	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$^{42}76^{000m}E$	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16' 52.5"	Corner Coordinates (Latitude, Longitude)



FLOOD PROFILES

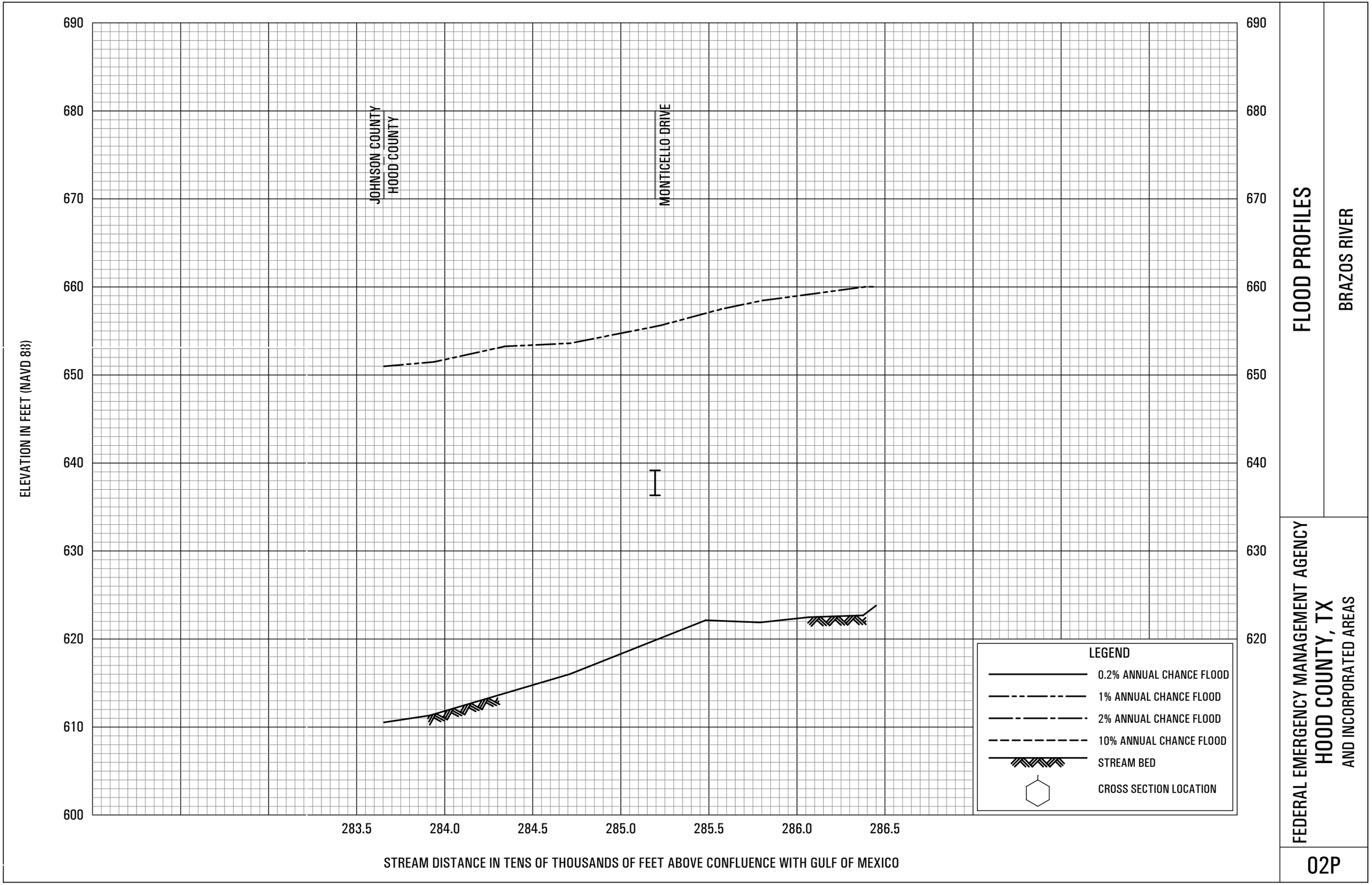
BRAZOS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

01P

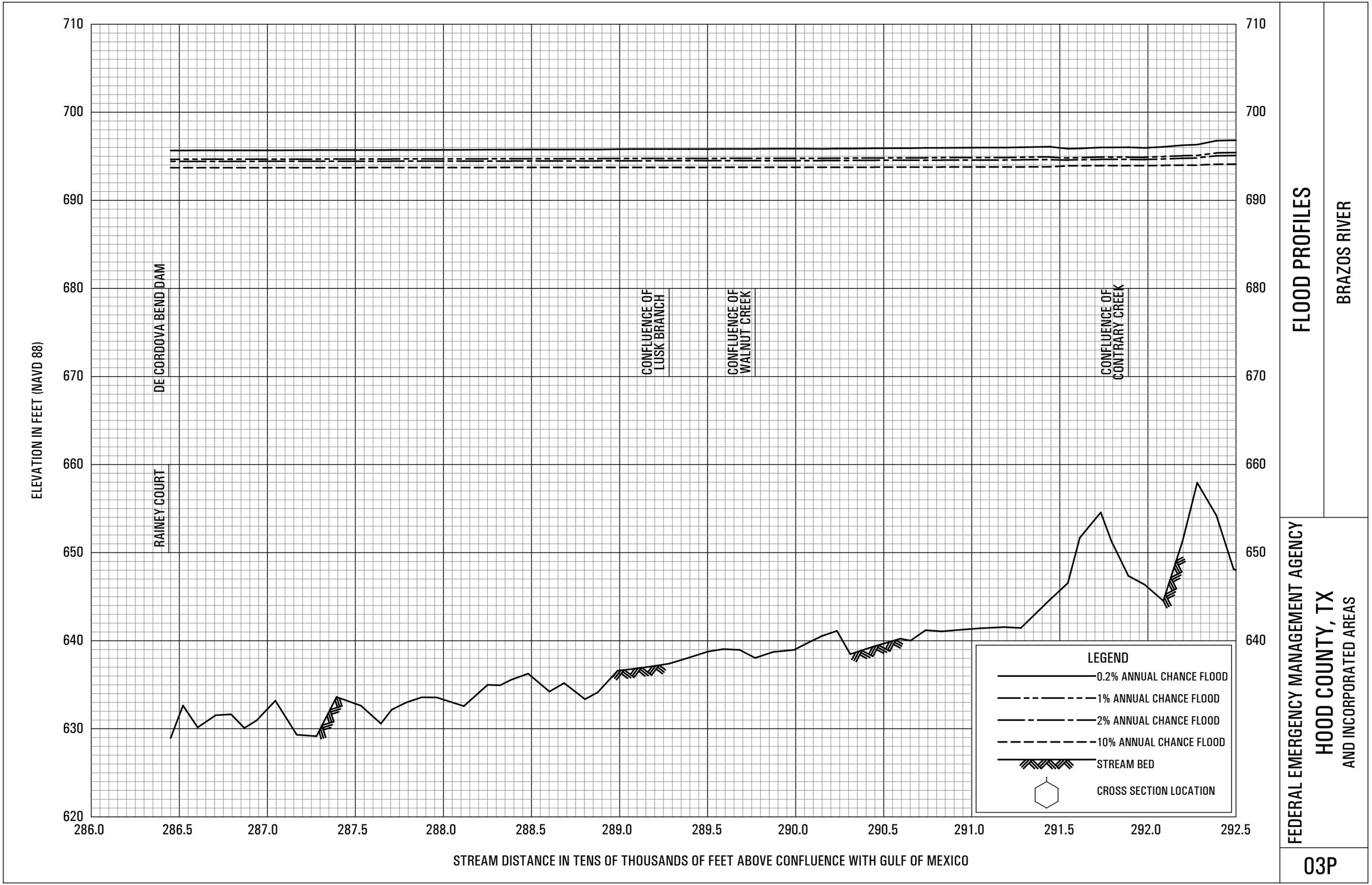


FLOOD PROFILES

BRAZOS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
HOOD COUNTY, TX
AND INCORPORATED AREAS

02P



FLOOD PROFILES

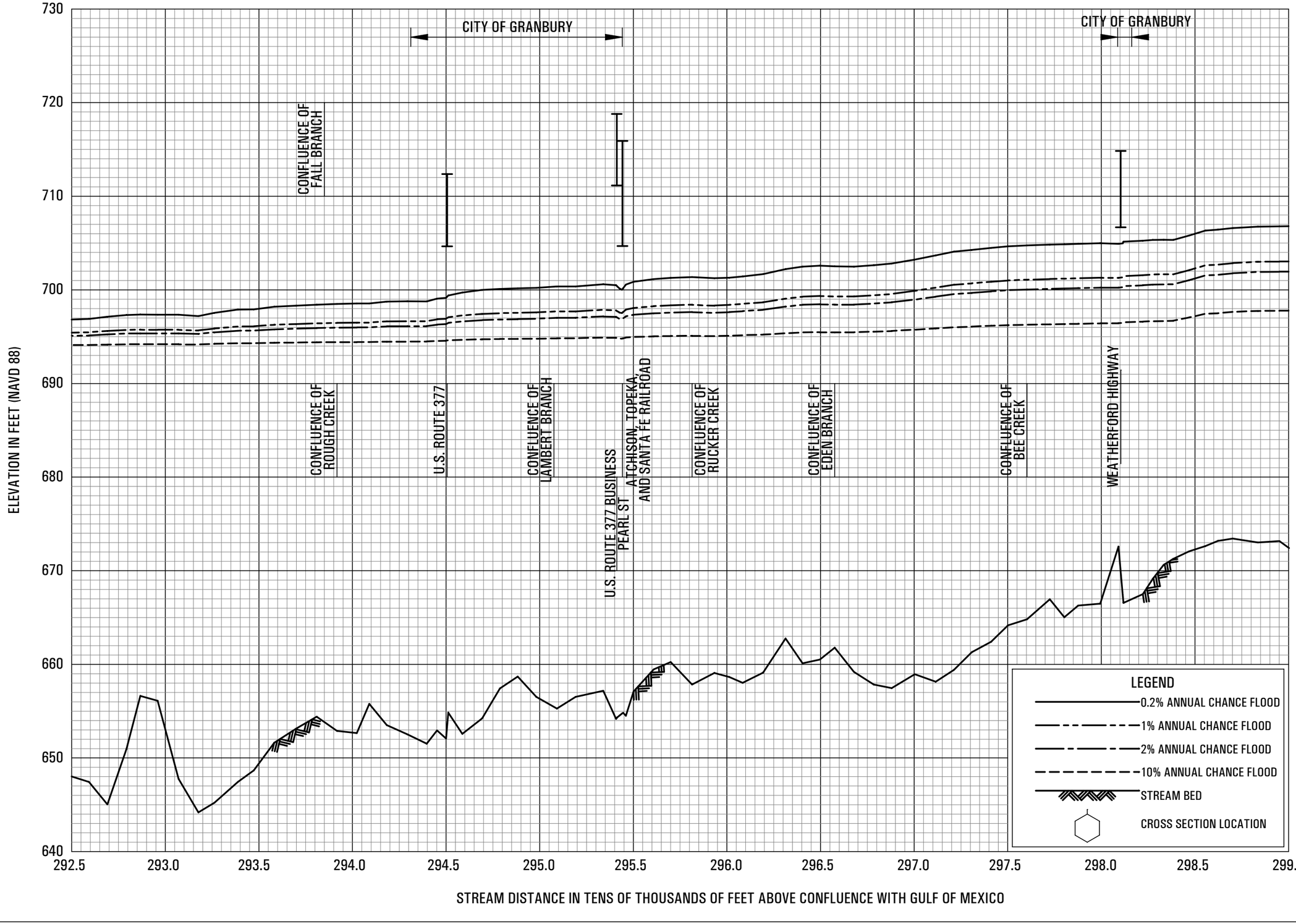
BRAZOS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

03P



FLOOD PROFILES

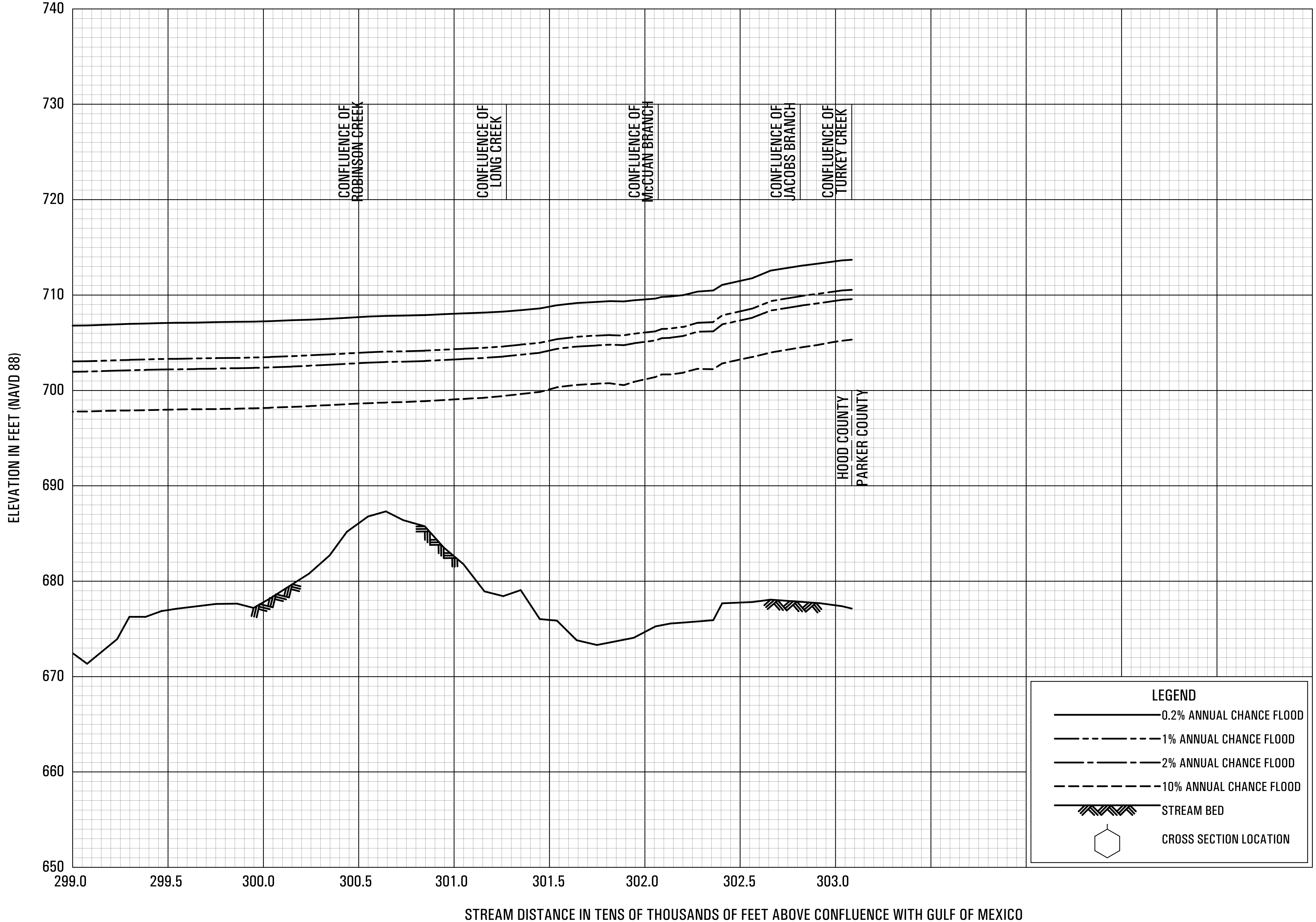
BRAZOS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

04P



FLOOD PROFILES

BRAZOS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

05P

CITY OF GRANBURY

BACKWATER FROM BRAZOS RIVER

CONFLUENCE WITH BRAZOS RIVER

ELEVATION IN FEET (NAVD 88)

730
720
710
700
690
680
670
660
650
640

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE WITH BRAZOS RIVER

A

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

LAMBERT BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

06P

CITY OF GRANBURY

CROCKETT STREET

F.M. 4
HOUSTON STREET

RUCKER STREET

TRAVIS STREET

ATCHINSON, TOPEKA, AND SANTA FE RAILROAD

MOORE STREET

CONFLUENCE OF STREAM LB-1

ELEVATION IN FEET (NAVD 88)

730
725
720
715
710
705
700
695
690
685

6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE WITH BRAZOS RIVER

B C D E F G H

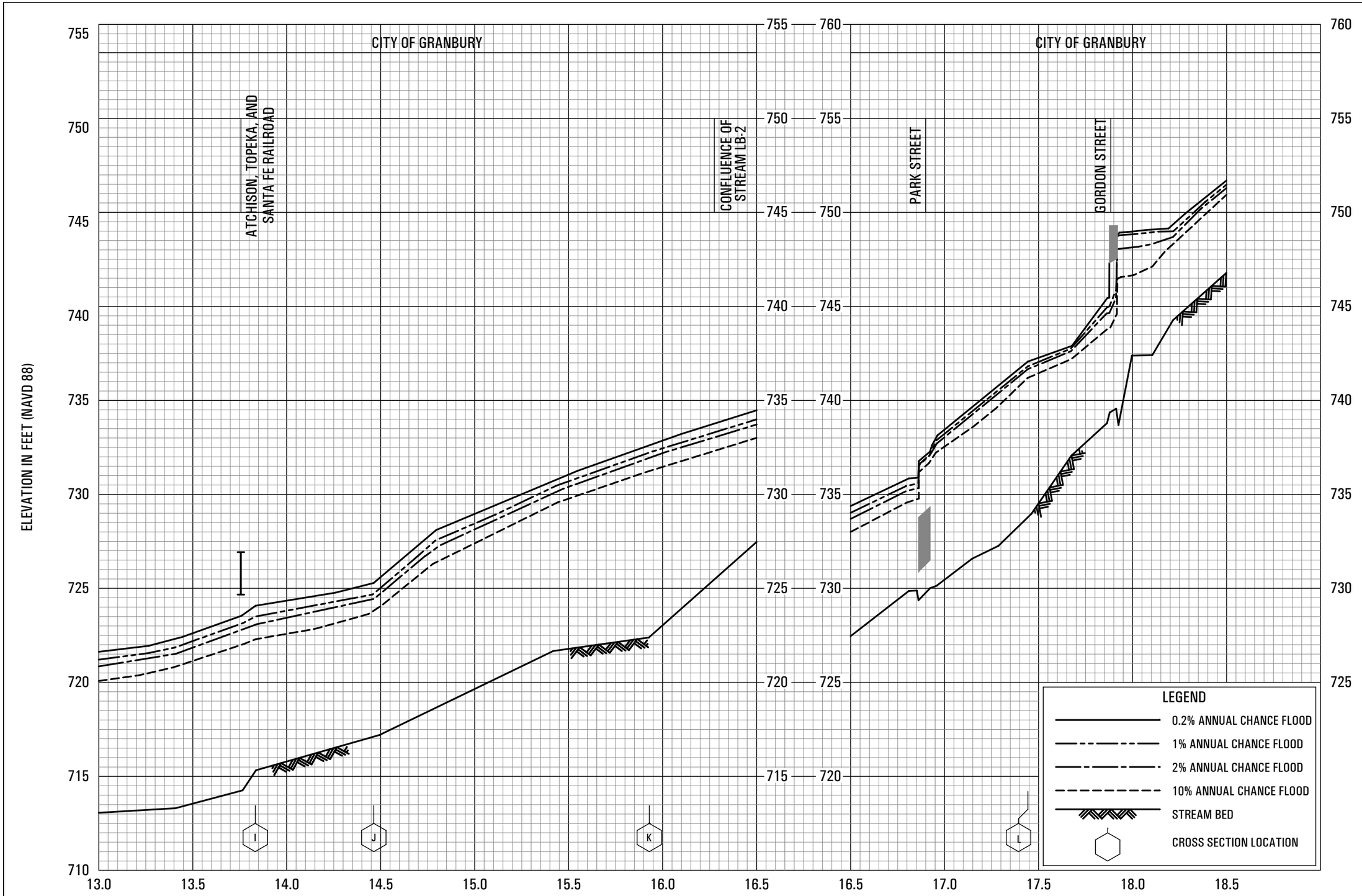
LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

LAMBERT BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
HOOD COUNTY, TX
AND INCORPORATED AREAS



FLOOD PROFILES

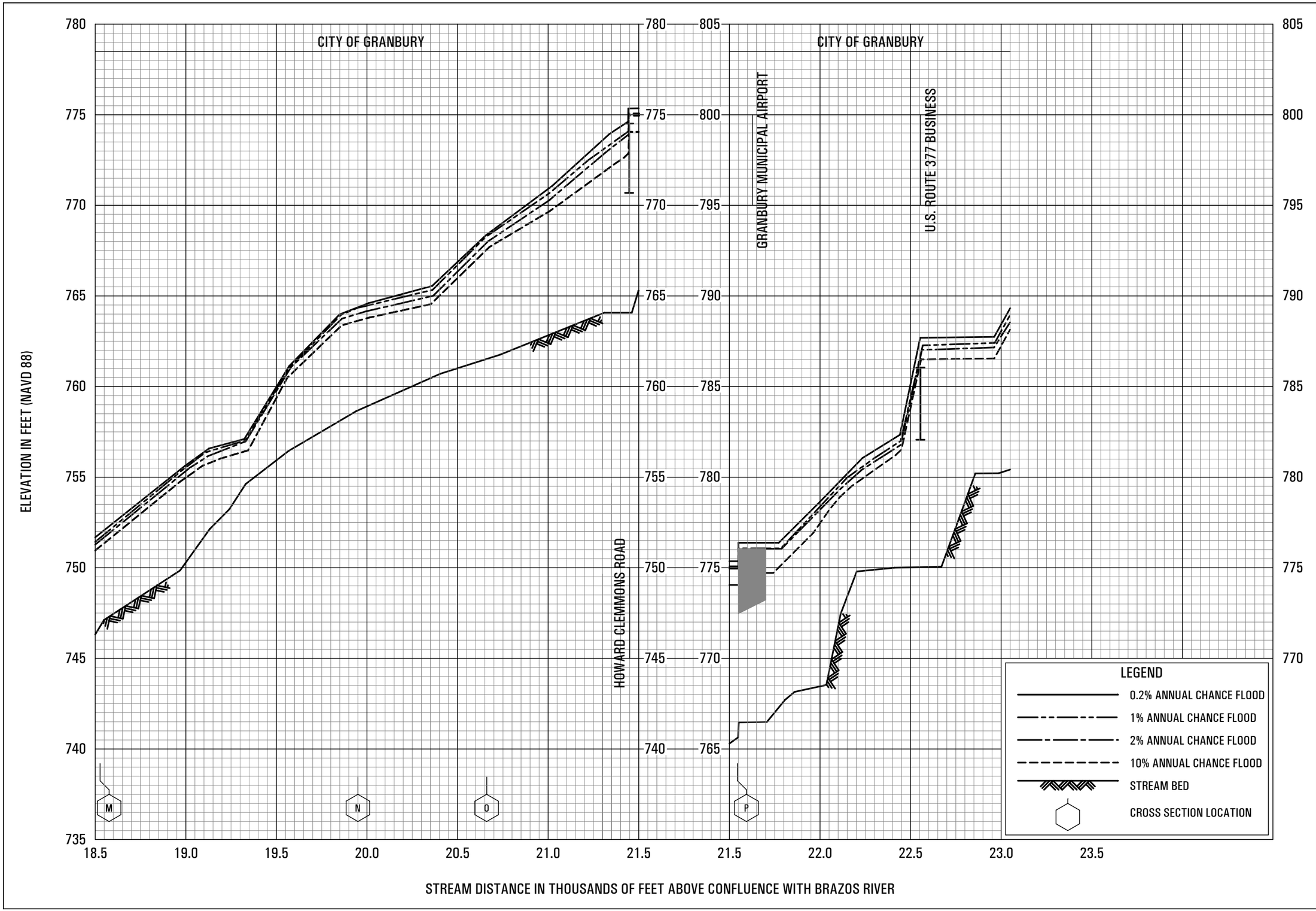
LAMBERT BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

08P

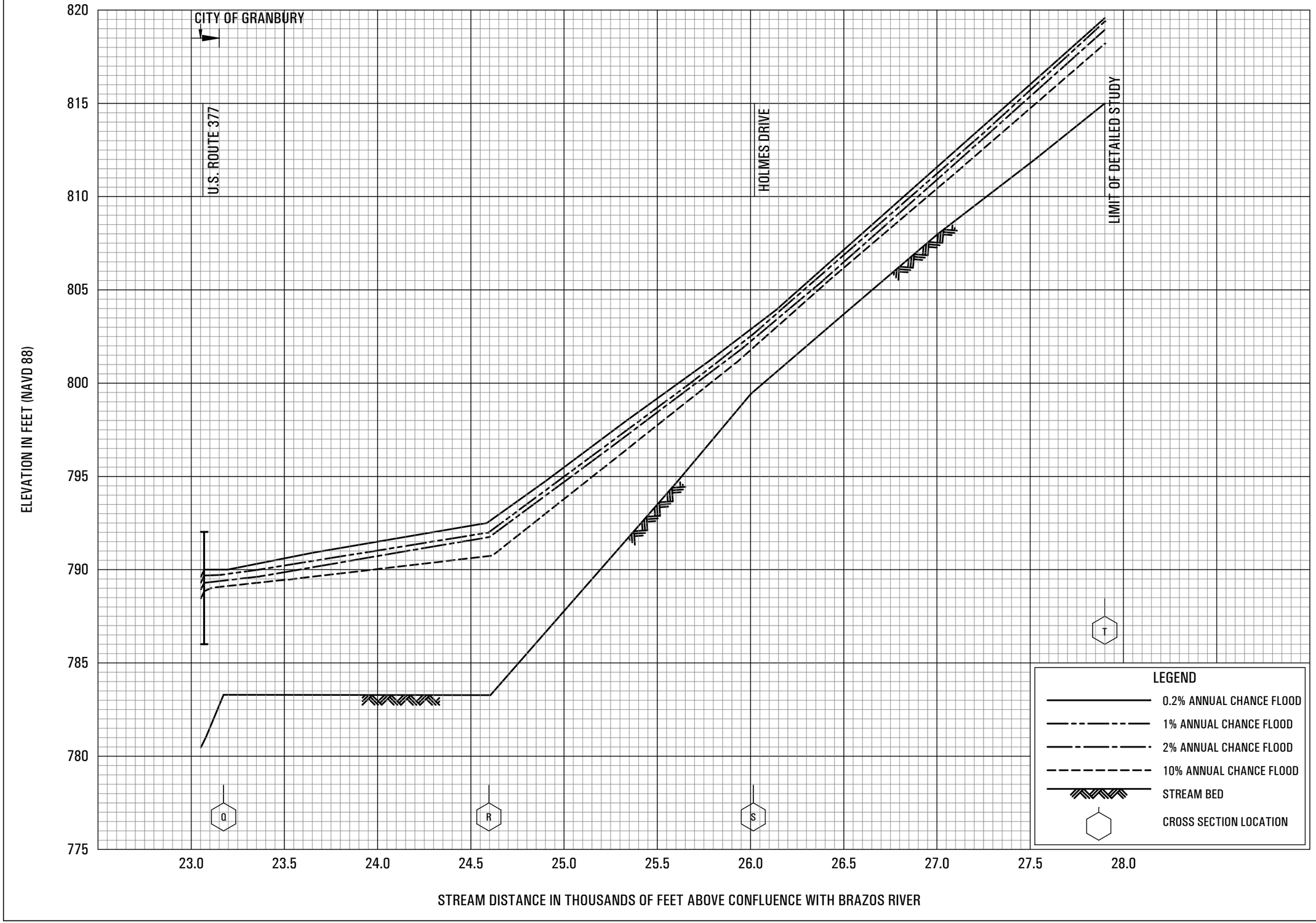


FLOOD PROFILES

LAMBERT BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
HOOD COUNTY, TX
AND INCORPORATED AREAS

09P



FLOOD PROFILES

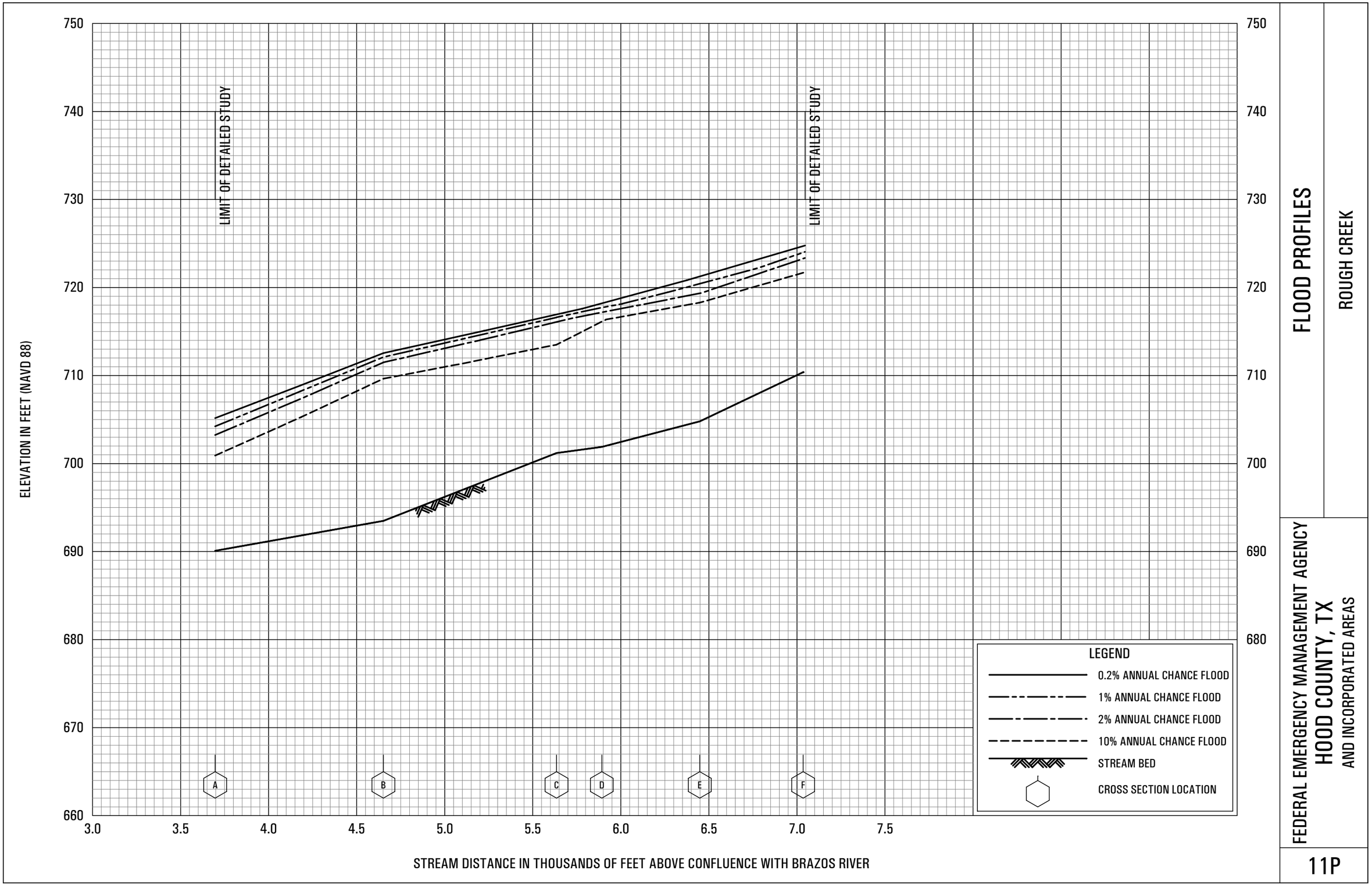
LAMBERT BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

10P



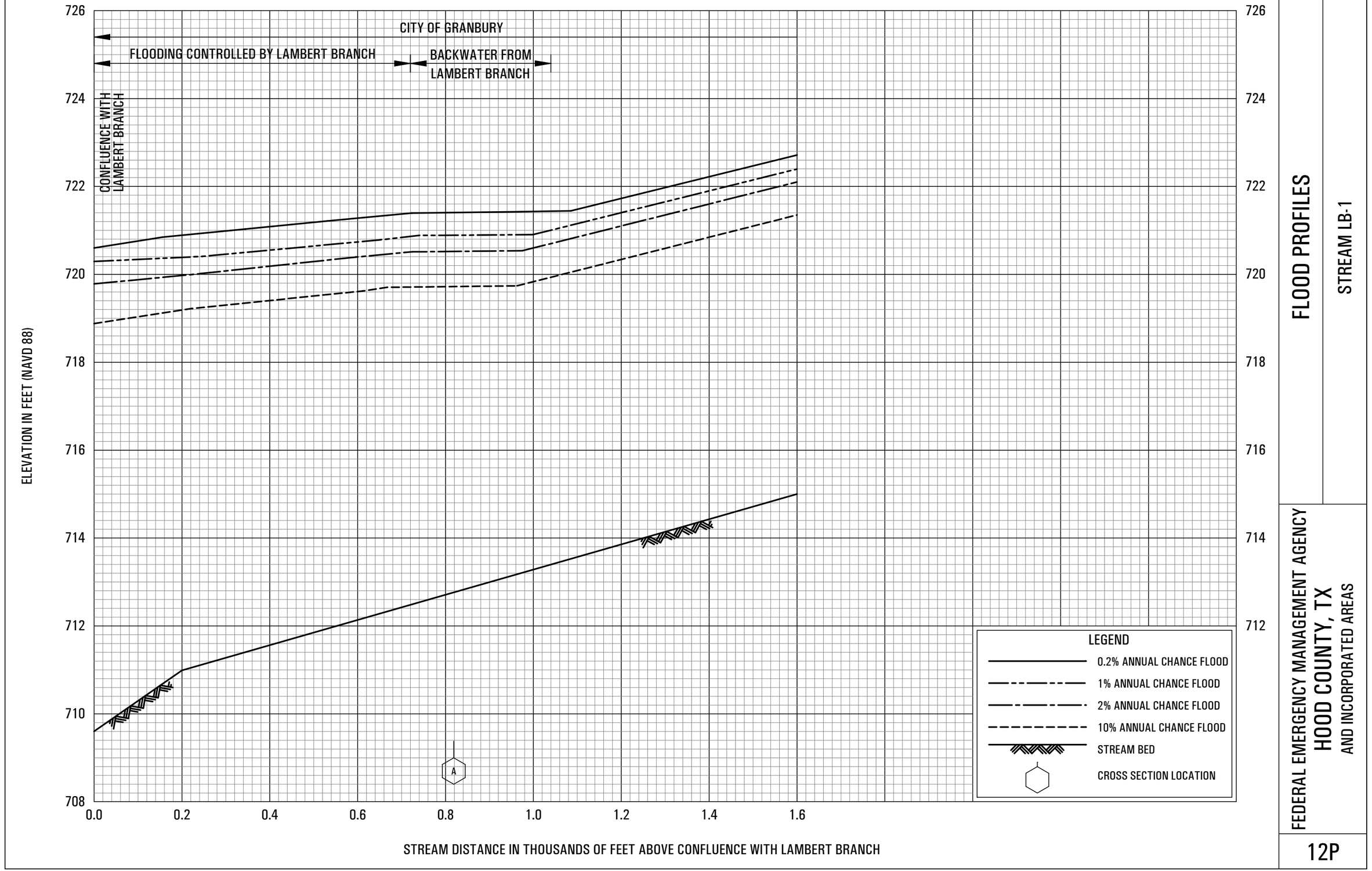
FLOOD PROFILES

ROUGH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

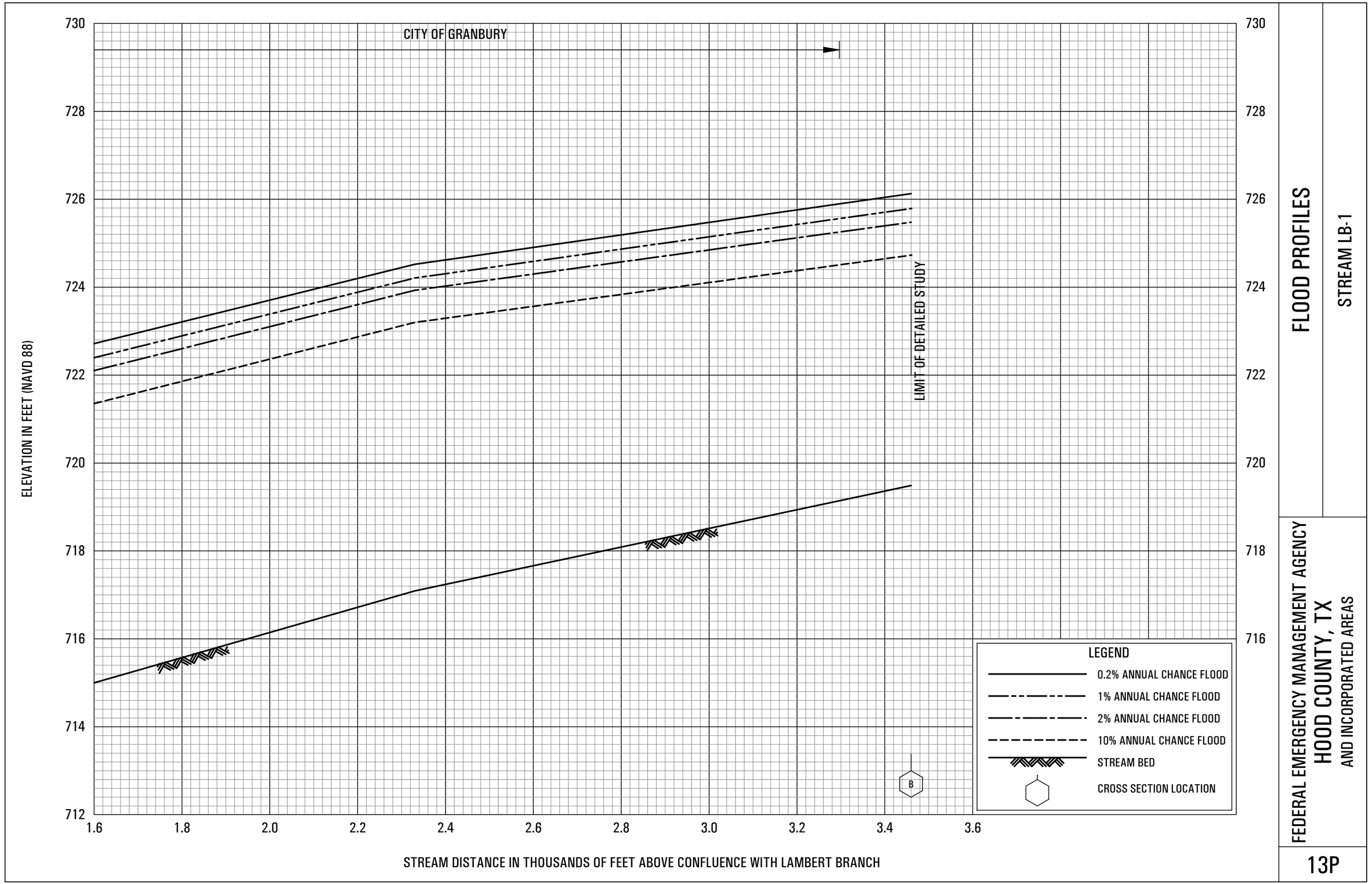


FLOOD PROFILES

STREAM LB-1

FEDERAL EMERGENCY MANAGEMENT AGENCY
HOOD COUNTY, TX
AND INCORPORATED AREAS

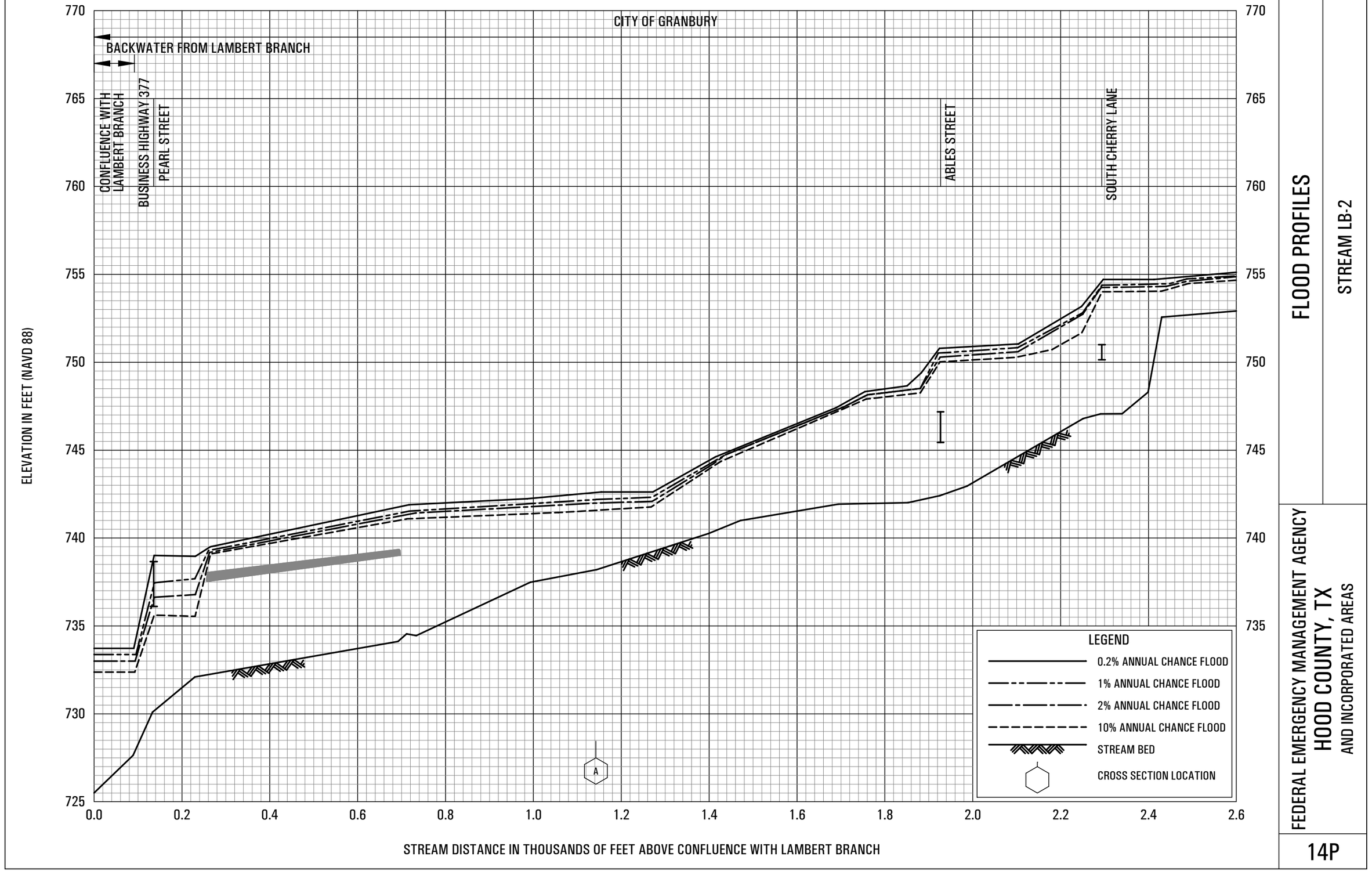
12P



FLOOD PROFILES

STREAM LB-1

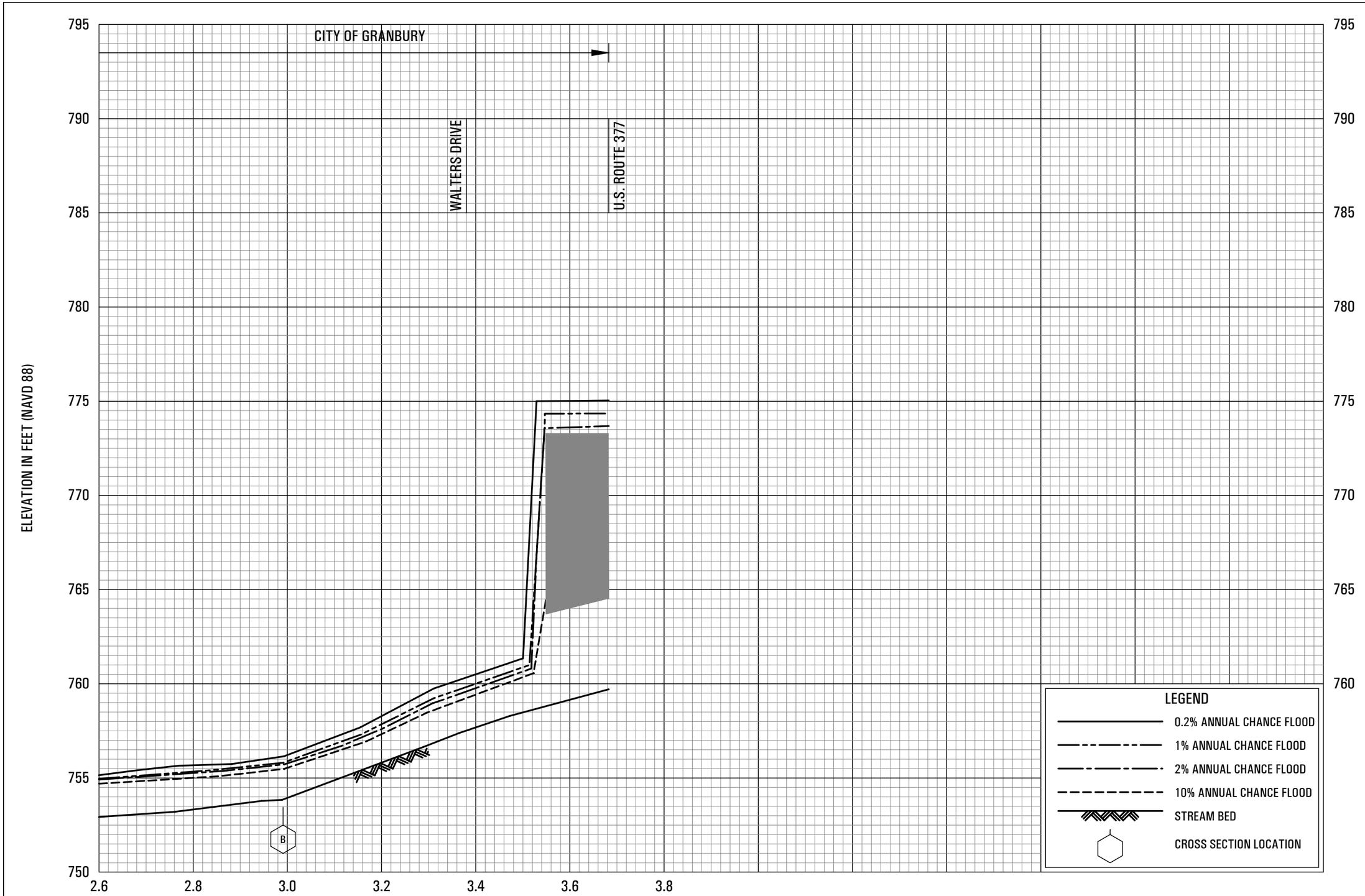
FEDERAL EMERGENCY MANAGEMENT AGENCY
HOOD COUNTY, TX
AND INCORPORATED AREAS



FLOOD PROFILES

STREAM LB-2

FEDERAL EMERGENCY MANAGEMENT AGENCY
HOOD COUNTY, TX
AND INCORPORATED AREAS

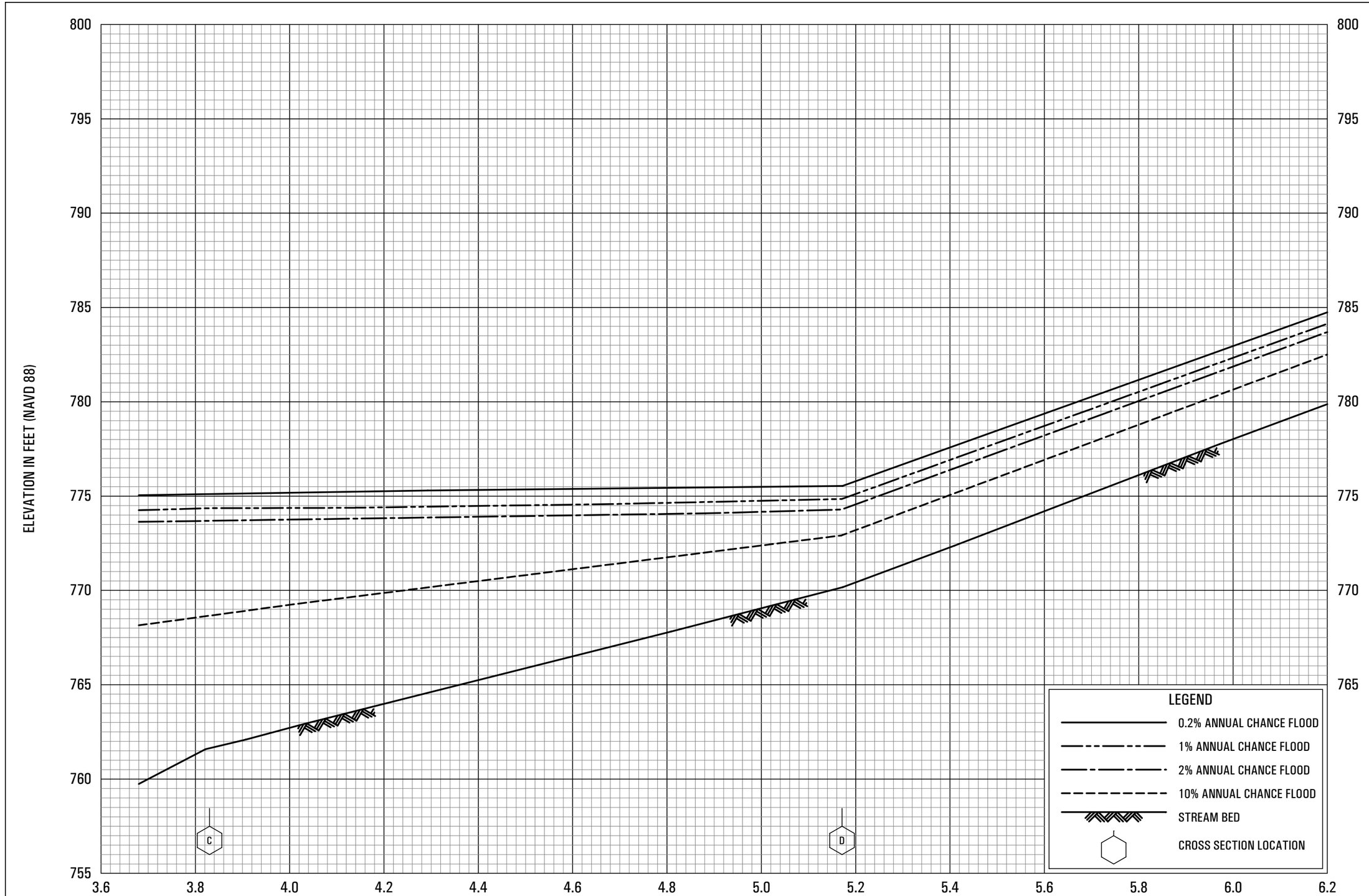


FLOOD PROFILES

STREAM LB-2

FEDERAL EMERGENCY MANAGEMENT AGENCY
HOOD COUNTY, TX
AND INCORPORATED AREAS

15P



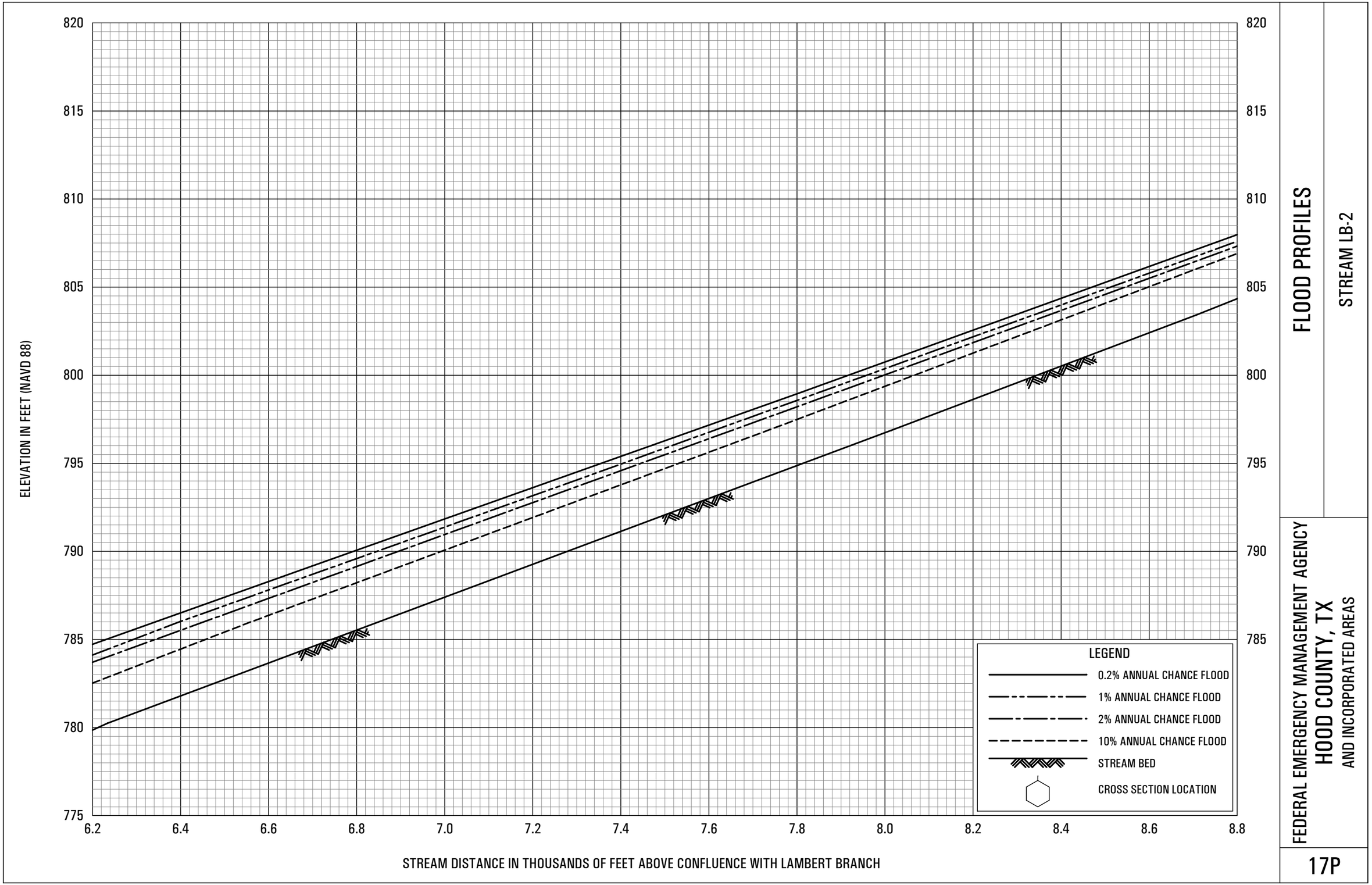
FLOOD PROFILES

STREAM LB-2

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS



FLOOD PROFILES

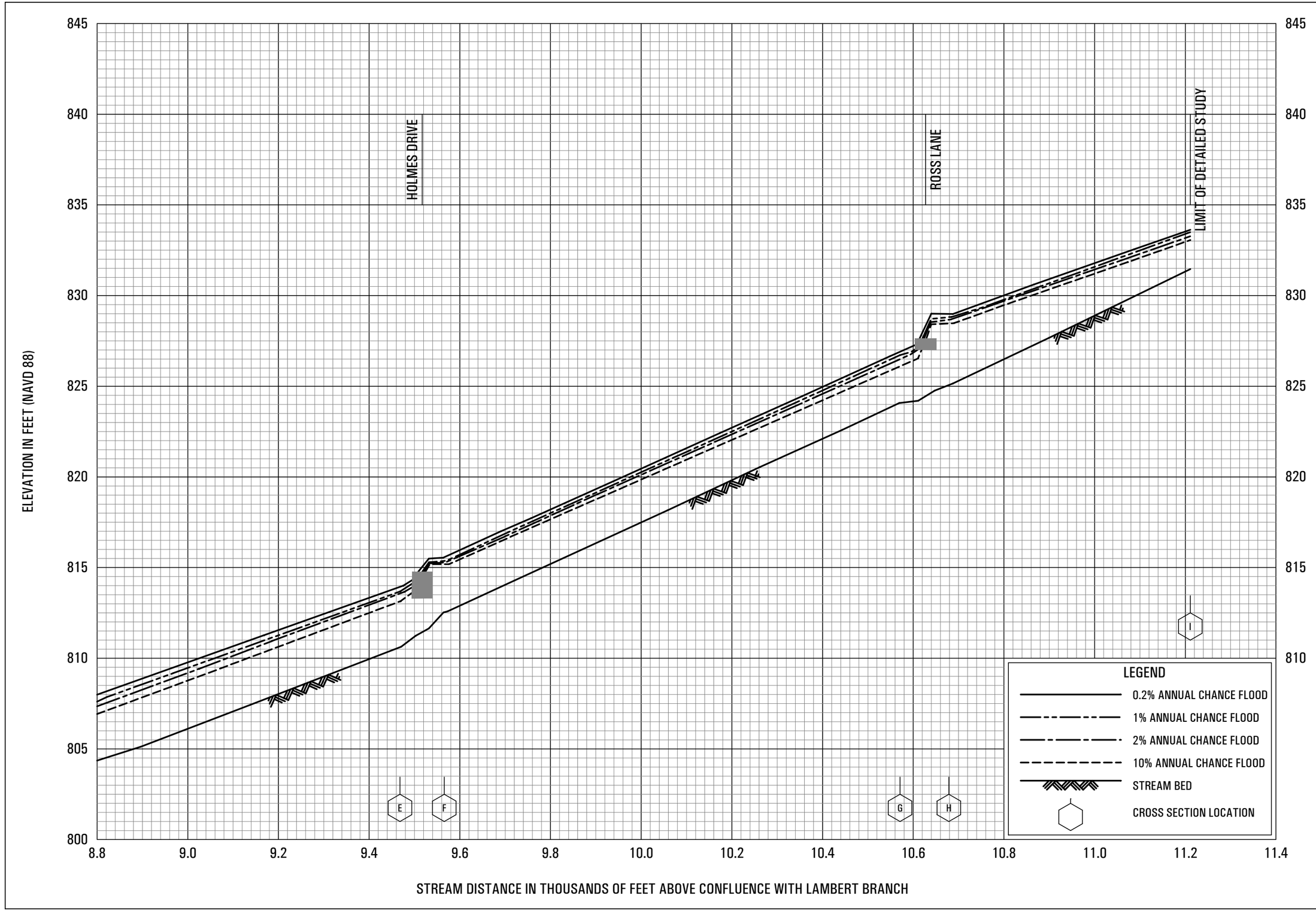
STREAM LB-2

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOOD COUNTY, TX

AND INCORPORATED AREAS

17P



FLOOD PROFILES

STREAM LB-2

FEDERAL EMERGENCY MANAGEMENT AGENCY
HOOD COUNTY, TX
AND INCORPORATED AREAS